AIR FORCE

QUALIFICATION TRAINING PACKAGE

(AFQTP)

for

STRUCTURAL

(3E3X1)

MODULE 28

FABRICATE AND INSTALL METAL COMPONENTS

TABLE OF CONTENTS

MODULE 28

FABRICATE AND INSTALL METAL COMPONENTS

Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.

OPR: HQ AFCESA/CEOT
(SMSgt Michael R. Shakal)

Certified by: HQ AFCESA/CEO
(Colonel Lance C. Brendel)

AIR FORCE QUALIFICATION TRAINING PACKAGES
for
STRUCTURAL
(3E3X1)

INTRODUCTION

Before starting this AFQTP, refer to and read the "Trainee/Trainer Guide" located on the AFCESA Web site **http://www.afcesa.af.mil/**

AFQTPs are mandatory and must be completed to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.

MANDATORY minimum upgrade requirements:

Core task:
AFQTP completion
Hands-on certification

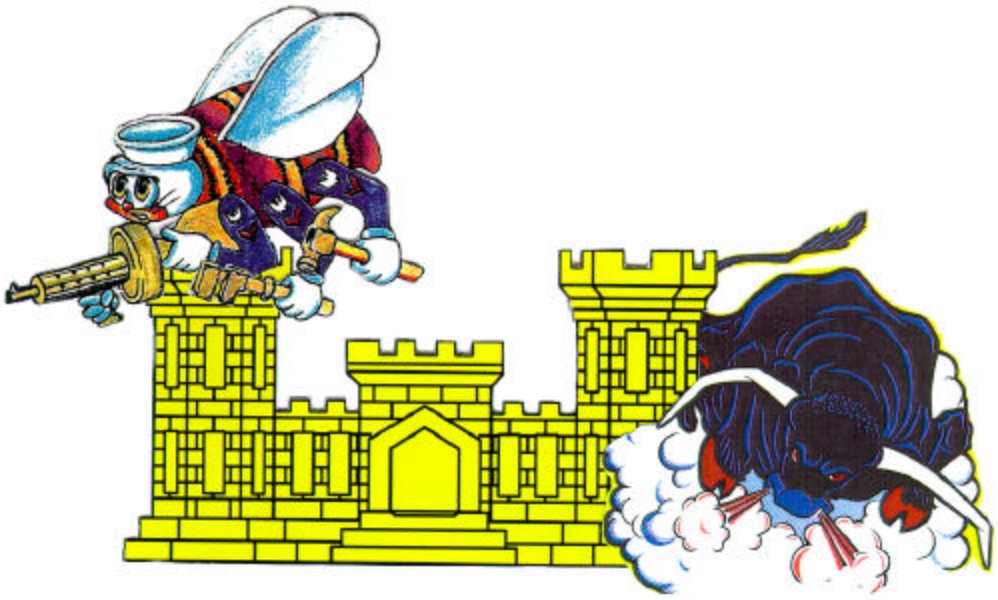
Diamond task:
AFQTP completion
CerTest completion (80% minimum to pass)

Note: *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

Put this package to use. Subject matter experts under the direction and guidance of HQ AFCESA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

HQ AFCESA/CEOT
139 Barnes Dr. Suite 1
Tyndall AFB, FL 32403-5319
DSN: 523-6421, Comm: (850) 283-6421
Fax: DSN 523-6488
E-mail: ceott.helpdesk@afcesa.af.mil

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.



LAY OUT METAL COMPONENTS USING:

MODULE 28 AFQTP UNIT 2

PARALLEL LINE DEVELOPMENT (28.2.2.)

PARALLEL LINE DEVELOPMENT

Task Training Guide

STS Reference Number/Title:	28.2.2. Parallel line development
Training References:	• 3E351 CDCs
Prerequisites:	• Possess as a minimum, a 3E331 AFSC
Equipment/Tools Required:	• Steel Rules, T-Square and Triangles, Compass and Dividers, Trammel Points, Protractor, and French Curve.
Learning Objective:	• Individual should be able to lay out square, round, and rectangular shaped ductwork using the parallel line development.
Samples of Behavior:	• Trainee will be able to successfully use the parallel line development.
Notes:	

PARALLEL LINE DEVELOPMENT

Background: The easiest and most often used method of layout is the parallel line layout. In this method you would layout patterns for components that have parallel sides. The true length of element lines is critical in parallel line development. They indicate the true length of the duct section.

There are three patterns that you can layout using the parallel line method: Round, Square, and Rectangular ducts.

Round Duct. ***To layout this pattern, follow these steps:***

Step 1: Draw the plan view of whatever size duct you need with your compass.
The plan view can be either a full or half view.

Step 2: Next, draw the elevation view just under your plan view.
With a T-square, and Triangle, come down from the sides of your plan view for the length of duct that you want.

Step 3: Finally, divide the plan view into 12 equal parts. Remember that the elements lines are the true length of the duct you want to layout.

Square and Rectangular Ducts. ***To lay out these patterns, follow these steps:***

For instructional purposes we will be laying out a 20" x10" x 30" section of duct.

Step 1: Draw 2 lines that are equal to the perimeter of the 4 sides.

Step 2: On the left side, draw an element line (which in this case will be 30" long) perpendicular to the stretch out line.

Step 3: Draw another element line 20" long parallel to the 30" line.

Step 4: Then draw one more element line 10" long parallel to the 20" line.

Repeat steps 3 and 4 once again making sure they are parallel to each other.

HINT:
Remember to allow for your seams and joints when laying out any ductwork.

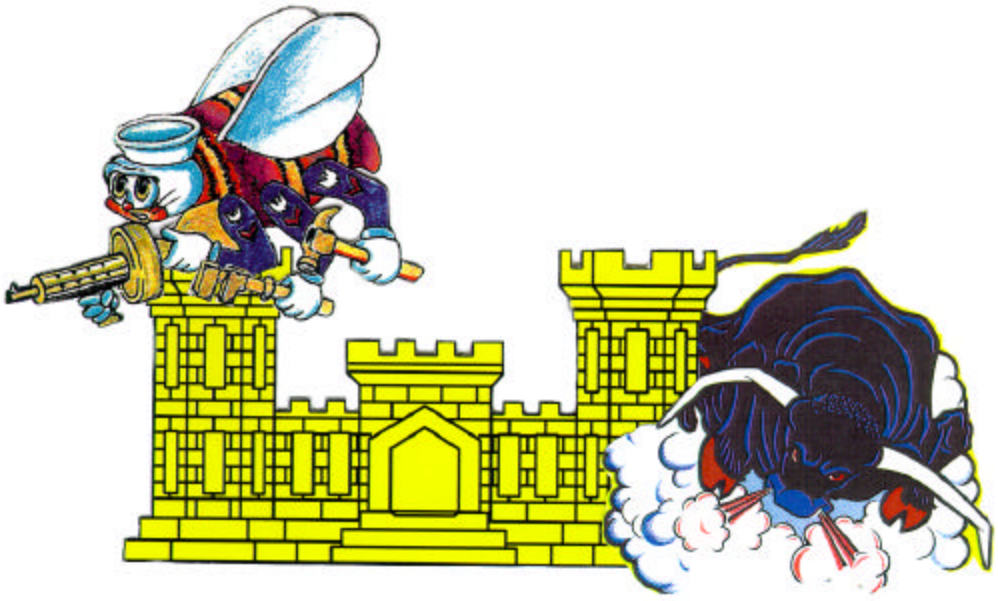
Review Questions
for
Parallel Line Development

Question	Answer
1. Round, Square and Rectangular are the three patterns you can use in parallel line development.	a. True b. False
2. What is the first view to layout using parallel line development in round duct?	a. Plan view b. Elevation view c. Detail view
3. True length lines are important because they indicate the true length of the duct system.	a. True b. False

PARALLEL LINE DEVELOPMENT

Performance Checklist		
Step	**Yes**	**No**
1. Was the trainee able to layout all 3 patterns using parallel line development?		
2. Did the trainee establish the plan view first in the layout?		
3. Were the true length lines the same length of your ductwork?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.



INSTALL

MODULE 28 **AFQTP UNIT 4**

DUCT SYSTEMS (28.4.1.)

DUCT SYSTEMS

Task Training Guide

STS Reference Number/Title:	28.4.1. Duct systems
Training References:	• 3E351 CDCs
Prerequisites:	• Possess as a minimum, a 3E331 AFSC
Equipment/Tools Required:	• Electric drill, Ladder, Gloves, Hammer, Hearing protection, Eye protection
Learning Objective:	• Individual should be able to install ductwork with no supervision.
Samples of Behavior:	• Trainee will be able to successfully install metal ductwork.
Notes:	

DUCT SYSTEMS

Background: After you have finished laying out the ductwork, it's time to install it. It's very important that you establish a centerline. This is an imaginary line that passes through the horizontal and vertical center of all your joints. The horizontal centerline is determined from the elevation view drawing, and the vertical centerline is determined from the plan view.

After each centerline is determined, it is time to install the hangers. The size of the hangers depends on the size, shape, and weight of the duct. These hangers are usually made of strips of metal that are nailed to the rafters or other structures in the attic.

HINT:
It is much easier to insulate the ductwork on the ground before you install it.

After the hangers are in place it's time to hang the duct. Starting with the plenum, attach a flexible connector. To eliminate vibrations, attach it to the unit first, and then attach the plenum. This connector is made of metal and cloth. Continue with the main trunk line, making sure that the centerline is always on the mark. Make sure that you have enough drives and S-bars to do the entire job.

After the main trunk line is complete, install the branch lines. Begin attaching the round take- off fittings to the main trunk line, by dovetailing them to the main trunk line. Continue the branch lines until you get to the diffuser positions. To install the diffusers, elbow the branch line down to the ceiling, stopping it just above the ceiling line. Then put the diffusers flush with the ceiling and attach it to the elbow with self-drilling screws.

Review Questions
for
Duct Systems

Question	Answer
1. What is the first thing you do before you hang your duct?	a. Get the center line of your duct b. Put the duct together c. Insulate your duct
2. A centerline passes through the horizontal and vertical center of all your joints?	a. True b. False
3. What do you attach the hangers to in the attic?	a. Rafters b. Ceiling joist c. Both a. and b.
4. A flexible connector should be attached to your unit before the ductwork can be installed.	a. True b. False

DUCT SYSTEMS

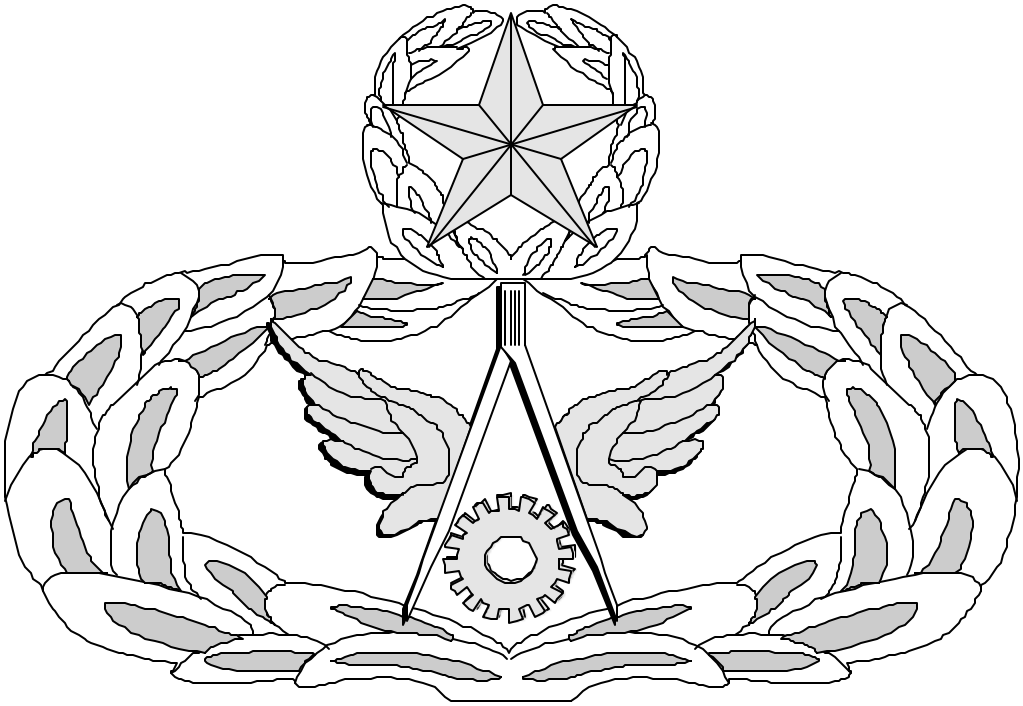
Performance Checklist		
Step	**Yes**	**No**
1. Was the trainee able to establish a centerline before hanging their duct system?		
2. Did the trainee use the plan and elevation views to establish their horizontal and vertical centerlines?		
3. Did trainee have enough drives and S-slips to complete the task?		
4. Did trainee install branch lines properly?		

FEEDBACK: Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

Air Force Civil Engineer

QUALIFICATION TRAINING PACKAGE (QTP)

REVIEW ANSWER KEY



For

STRUCTURAL

(3E3X1)

MODULE 28

FABRICATE AND INSTALL METAL COMPONENTS

Notice. This AFQTP is *NOT* intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

PARALLEL LINE DEVELOPMENT

(3E3X1-28.2.2.)

Question	Answer
1. Round, Square and Rectangular are the three patterns you can use in parallel line development.	a. True
2. What is the first view to layout using parallel line development in round duct?	a. Plan view
3. True length lines are important because they indicate the true length of the duct system.	a. True

DUCT SYSTEMS

(3E3X1-28.4.1.)

Question	Answer
1. What is the first thing you do before you hang your duct?	a. Get the center line of your duct
2. A centerline passes through the horizontal and vertical center of all your joints?	a. True
3. What do you attach the hangers to in the attic?	c. Both a. and b.
4. A flexible connector should be attached to your unit before the ductwork can be installed.	a. True